UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to:
OSB1999-0201

September 2, 1999

Ms. Karen Kochenbach
U.S. Army Corps of Engineers, Portland District
ATTN: Ms. Judy Linton
P.O. Box 2946
Portland, Oregon 97232

Re: Biological Opinion on Corps of Engineers' Permit 99-157, Schooner Creek Boat Works

Dear Ms. Kochenbach:

Enclosed is the National Marine Fisheries Service's (NMFS) biological opinion on the Schooner Creek Boat Works (permit 99-157) as described in the U.S. Army Corps of Engineer's Biological Assessments (BA) dated April 8, 1999. This opinion addresses Snake River sockeye salmon (*Oncorhynchus nerka*), Snake River spring/summer chinook salmon (*O. tshawytscha*), Snake River fall chinook salmon (*O. tshawytscha*), Lower Columbia River steelhead (*O. mykiss*), Upper Columbia River steelhead (*O. mykiss*), Snake River steelhead (*O. mykiss*), Upper Willamette River steelhead (*O. mykiss*), Middle Columbia River steelhead (*O. mykiss*), Columbia River chum salmon (*O. keta*), Lower Columbia River chinook salmon (*O. tshawytscha*), Upper Willamette River chinook salmon (*O. tshawytscha*), Upper Columbia River spring run chinook salmon (*O. tshawytscha*), and Southwestern WA/Columbia River coastal cutthroat trout (*O. clarki clarki*). This opinion constitutes formal consultation for those listed species. The NMFS has determined that the subject action, as proposed, is not likely to jeopardize the continued existence of those listed species.

Sincerely,

William Stelle, Jr.
Regional Administrator

Enclosure

Endangered Species Act - Section 7
Consultation

BIOLOGICAL OPINION

Schooner Creek Boat Works

Agency: U.S. Army Corps of Engineers - Portland District

Consultation Conducted By: National Marine Fisheries Service,
Northwest Region

Date Issued: September 2, 1999

Refer to: OSB1999-0201

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I. Background

On April 8, 1999, the U.S. Army Corps of Engineers (COE) sent a letter to Elizabeth Gaar, of the National Marine Fisheries Service (NMFS), requesting informal consultation for construction of a moorage facility and boat lift for an existing boat fabrication facility in Canoe Bay, Columbia River mile 105.8, Portland, Oregon. Included with the letter was a COE Public Notice (99-157).

The NMFS requested, and was provided, further information from the COE on the project in May of 1999. The COE also provided further project design refinements in a June 28, 1999, letter.

The objective of this Biological Opinion (BO) is to determine whether issuance of the proposed permit is likely to jeopardize the continued existence of twelve salmonid species listed under the Endangered Species Act (Table 1), or result in the destruction or adverse modification of their designated or proposed critical habitat.

Table 1: Species considered in this Biological Opinion

Common Name	Scientific Name	Listing Status
Snake River sockeye salmon	*Oncorhynchus nerka*	Endangered
Snake River spring/summer chinook salmon	*O. tshawytscha*	Threatened
Snake River fall chinook salmon	*O. tshawytscha*	Threatened
Lower Columbia River steelhead	*O. mykiss*	Threatened
Upper Columbia River steelhead	*O. mykiss*	Endangered
Snake River steelhead	*O. mykiss*	Threatened
Middle Columbia River steelhead	*O. mykiss*	Threatened
Columbia River chum salmon	*O. keta*	Threatened
Lower Columbia River chinook salmon	*O. tshawytscha*	Threatened
Upper Columbia River spring run chinook salmon	*O. tshawytscha*	Endangered
S.W. Washington/Lower Columbia River Coastal Cutthroat Trout	*O. clarki clarki*	Proposed (Threatened)

II. Proposed Action

The proposed action is issuance of a COE permit (# 99-157) for the construction of a 10' X 500' dock with 4' wide finger docks and the relocation of two floating boathouses for temporary storage of vessels being constructed or repaired at the boat fabrication facility.

The two boathouses would be altered to have translucent panels or windows on the sides and roof to allow for maximum light penetration. The docks will also be designed so that no section of dock will be wider than four feet will be without grating. Pilings for the dock will be of steel, non-treated wood or concrete. All construction shall occur during the in-water work window of November 1 to February 28. Any disturbance to the bankline area will be replanted to prevent erosion.

III. Biological Information and Critical Habitat

Based on migratory timing, it is not likely that any adult or juvenile salmon or steelhead would be present during the proposed in-water work period. Lower Columbia River steelhead may be utilizing the backwater areas of the lower Columbia River to over-winter, but that usage has not been quantified. There is a potential for all species to occur in the area after construction is completed. The proposed action would occur within designated critical habitat for some of the listed salmon species (Table 2).

The action area is defined by NMFS regulations (50 CFR Part 402) as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The action area includes designated critical habitat affected by the proposed action within the Columbia River in Canoe Bay at river mile 105.8. This area serves as a migratory corridor for both adult and juvenile life stages of all listed species under consideration in this BO. Essential features of the adult and juvenile migratory corridor for the species are: (1) Substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food (juvenile only), (8) riparian vegetation, (9) space, and (10) safe passage conditions (50 CFR Part 226). The essential features this proposed project may affect are water quality, and riparian vegetation resulting from construction activities and safe passage conditions as a result of the structures placed in the river.

References for further background on listing status, biological information and critical habitat elements can be found in Table 2.

IV. Evaluating Proposed Actions

The standards for determining jeopardy are set forth in Section 7(a)(2) of the ESA as defined by 50 C.F.R. Part 402 (the consultation regulations). NMFS discusses the analysis necessary for application of these standards in the particular context of the listed species of Pacific salmon in Attachment 1. NMFS must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of (1) defining the biological requirements of the listed species, and (2) evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NMFS evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In

making this determination, NMFS must consider the estimated level of mortality attributable to: (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmon's life stages that occur beyond the action area. If NMFS finds that the action is likely to jeopardize, NMFS must identify reasonable and prudent alternatives for the action.

Furthermore, NMFS evaluates whether the action directly or indirectly, is likely to destroy or adversely modify the listed species' critical habitat. The NMFS must determine whether habitat modifications appreciably diminish the value of critical habitat for both survival and recovery of the listed species. The NMFS identifies those effects of the action that impair the function of any essential feature of critical habitat. The NMFS then considers whether such impairment appreciably diminishes the habitat's value for the species' survival and recovery. If NMFS concludes that the action will adversely modify critical habitat it must identify any reasonable and prudent alternatives available.

For the proposed action, NMFS's jeopardy analysis considers direct or indirect mortality of fish attributable to the action. NMFS's critical habitat analysis considers the extent to which the proposed action impairs the function of essential elements necessary for adult and juvenile migration of the listed salmon under the existing environmental baseline.

Table 2. References for additional background on listing status, biological information, and critical habitat elements for the Listed and Proposed Species addressed in this biological and conference opinion.

Species	**Listing Status Final Rule Publication Date**	**Critical Habitat**	**Biological Information, Historical Population Trends**
Snake River Sockeye Salmon	November 20, 1991; 56 FR 58619	December 28, 1993; 58 FR 68543 (FINAL RULE)	Waples *et al*. 1991a; Burgner 1991
Snake River Fall Chinook Salmon	April 22, 1992; 57 FR 34653	December 28, 1993; 58 FR 68543 (FINAL RULE)	Waples *et al*. 1991b; Healey 1991
Snake River Spring/Summer Chinook Salmon	April 22, 1992; 57 FR 34653	December 28, 1993; 58 FR 68543 (FINAL RULE)	Matthews and Waples 1991; Healey 1991
Upper Willamette River Chinook Salmon	March 24, 1999; 64 FR 14308	March 9, 1998; 63 FR 11482 (PROPOSED RULE)	Myers *et al*.1998; Healey 1991
Upper Columbia River Spring Chinook Salmon	March 24, 1999; 64 FR 14308	March 9, 1998; 63 FR 11482 (PROPOSED RULE)	Myers *et al*.1998; Healey 1991
Lower Columbia River Chinook Salmon	March 24, 1999; 64 FR 14308	March 9, 1998; 63 FR 11482 (PROPOSED RULE)	Myers *et al*.1998; Healey 1991
Snake River Basin Steelhead	August 18, 1997; 62 FR 43937	February 5, 1999; 64 FR 5740 (PROPOSED RULE)	Busby *et al*. 1995; Busby *et al*. 1996
Upper Columbia River Steelhead	August 18, 1997; 62 FR 43937	February 5, 1999; 64 FR 5740 (PROPOSED RULE)	Busby *et al*. 1995; Busby *et al*. 1996
Middle Columbia River Steelhead	March 25, 1999; 64 FR 14517	February 5, 1999; 64 FR 5740 (PROPOSED RULE)	Busby *et al*. 1995; Busby *et al*. 1996

Table 2. References for additional background on listing status, biological information, and critical habitat elements for the Listed and Proposed Species addressed in this biological and conference opinion.

Upper Willamette River Steelhead	March 25, 1999; 64 FR 14517	February 5, 1999; 64 FR 5740 (PROPOSED RULE)	Busby *et al*. 1995; Busby *et al*. 1996
Lower Columbia River Steelhead	March 19, 1998; 63 FR 13347	February 5, 1999; 64 FR 5740 (PROPOSED RULE)	Busby *et al*. 1995; Busby *et al*. 1996
Columbia River Chum Salmon	March 25, 1999; 64 FR 14308	March 10, 1998; 63 FR 11774 (PROPOSED RULE)	Johnson *et al*.1997; Salo 1991
S.W. Washington/Lower Columbia River Coastal Cutthroat Trout	Proposed April 5, 1999; 64 FR 16397	N/A	Johnson *et al*.1999; Trotter 1989

A. Biological Requirements

The first step in the method NMFS uses for applying the ESA standards of § 7 (a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation.

The relevant biological requirements are those necessary for the listed species to survive and recover to naturally reproducing population levels at which protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stocks, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

For this consultation, the biological requirements are increased migration survival and improved habitat characteristics that function to support successful migration.

B. Environmental Baseline

The biological requirements of the listed species are currently not being met under the environmental baseline. Their status is such that there must be a significant improvement in the environmental conditions of the critical habitat (over those currently available under the environmental baseline). Any further degradation of these conditions would have a significant impact due to the amount of risk the listed salmon presently face under the environmental baseline.

The proposed action area is located in Canoe Bay, a back-water area of the Columbia River. The area 300' on each side of the Columbia River has been designated as critical habitat for Snake River spring/summer chinook, Snake River fall chinook and Snake River sockeye salmon (December 28, 1993, 58 FR 68543). Critical habitat for the other listed species has not been designated.

The area around Canoe Bay has undergone substantial development. Part-time residential houses and businesses are being constructed adjacent to the Columbia River, with concurrent requests for private moorages. Substantial numbers of docks and float houses have been placed in this area in the past. The proliferation of boat docks and individual piers within an area may result in adverse cumulative effects. There is a substantial lack of information about these cumulative effects in the Lower Columbia River. This is especially critical in areas that are undergoing rapid urbanization, such as is found in the Lower Columbia River. The addition of a boat dock and boathouse by itself into an area that is devoid of other structures, and has a sufficient environmental baseline, should pose no significant risk to salmonids. However, since the environmental baseline is not meeting the biological requirements of the listed species and there is insufficient information on cumulative effects in this area, an additional boat dock and a pier could pose a significant risk to salmonids.

V. Analysis of Effects

A. Effects of Proposed Action

The mainstem Columbia River is an important migration route for numerous species of anadromous fish. During migration, juvenile fall chinook salmon typically key on shallow, nearshore habitats (Dawley et al. 1986). Sockeye salmon and steelhead juveniles are normally found mid-river during migration (Dawley et al. 1986).

Juvenile salmonid species such as spring chinook, sockeye, and coho salmon and up-river steelhead usually move downriver relatively quickly and in the main channel. This would aid in predator avoidance (Gray and Rondorf 1986). Fall and summer chinook salmon are found in nearshore, littoral habitats and are particularly vulnerable to predation (Gray and Rondorf 1986). Juvenile salmonids (chinook and coho salmon, and cutthroat trout) utilize backwater areas during their outmigration (Parente and Smith 1981). In addition, the presence of predators may force smaller prey fish species into less desirable habitats, disrupting foraging behavior, resulting in less growth (Dunsmoor et al. 1991).

When a salmon stock suffers from low abundance, predation can contribute significantly to its extinction (Larkin 1979). Further, providing temporary respite from predation may contribute to increasing Pacific salmon (Larkin 1979). A substantial reduction in predators will generally result in an increase in prey (in this case, salmonids) abundance (Campbell 1979). Gray and Rondorf (1986), in evaluating predation in the Columbia River Basin, state that "The most effective management program may be to reduce the susceptibility of juvenile salmonids to predation by providing maximum protection during their downstream migration." Campbell (1979), discussing management of large rivers and predator-prey relations, advocates that a "do nothing" approach (as opposed to predator manipulations) coupled with a strong habitat protectionist policy, should receive serious consideration.

Over-water Structures

Predator species such as northern pikeminnow (*Ptychocheilus oregonensis*), and introduced predators such as largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), black crappie (*Pomoxis nigromaculatus*) white crappie (*P. annularis*) and, potentially, walleye (*Stizostedion vitreum*) (Ward et al. 1994, Poe et al. 1991, Beamesderfer and Rieman 1991, Rieman et al. 1991, Petersen et al. 1990, Pflug and Pauley 1984, and Collis et al. 1995) may utilize habitat created by over-water structures (Ward and Nigro 1992, Pflug and Pauley 1984) such as piers, float houses, floats and docks. However, the extent of increase in predation on salmonids in the lower Columbia River resulting from over-water structures is not well known.

Major habitat types utilized by largemouth bass include vegetated areas, open water and areas with cover such as docks and submerged trees (Mesing and Wicker 1986). During the summer, bass prefer pilings, rock formations, areas beneath moored boats, and alongside docks (Bill Monroe, *The*

Oregonian, May 21, 1997). Colle et al. (1989) found that, in lakes lacking vegetation, largemouth bass distinctly preferred habitat associated with piers, a situation analogous to the Columbia River. Marinas also provide wintering habitat for largemouth bass out of mainstem current velocities (Raibley et al. 1997). Bevelhimer (1996), in studies on smallmouth bass, indicates that ambush cover and low light intensities create a predation advantage for predators and can also increase foraging efficiency. Wanjala et al. (1986) found that adult largemouth bass (*Micropterus salmoides*) in a lake were generally found near submerged structures suitable for ambush feeding. The slower currents found in Canoe Bay make this area conducive to largemouth bass.

Black crappie and white crappie are known to prey on juvenile salmonids (Ward et al. 1991). Ward et al. (1991), in their studies of crappies within the Willamette River, found that the highest density of crappies at their sampling sites occurred at a wharf supported by closely spaced pilings. They further indicated that suitable habitat for crappies includes pilings and riprap areas. Walters et al. (1991) also found that crappie were attracted to in-water structures and recommended placement of structures as attractants in lake environs.

Ward (1992) found that stomachs of northern pikeminnow in developed areas of Portland Harbor contained 30% more salmonids than those in undeveloped areas, although undeveloped areas contained more northern pikeminnow.

There are four major predatory strategies utilized by piscivorous fish: they run down prey; ambush prey; habituate prey to a non-aggressive illusion; or stalk prey (Hobson 1979). Ambush predation is probably the most common strategy: predators lie-in-wait, then dart out at the prey in an explosive rush (Gerking 1994). Predators may use sheltered areas that provide slack water to ambush prey fish in faster currents (Bell 1991).

Light plays an important role in defense from predation. Prey species are better able to see predators under high light intensity, thus providing the prey species with an advantage (Hobson 1979). Petersen and Gadomski (1994) found that predator success was higher at lower light intensities. Prey fish lose their ability to school at low light intensities, making them vulnerable to predation (Petersen and Gadomski 1994). Howick and O'Brien (1983) found that in high light intensities prey species (bluegill) can locate largemouth bass before they are seen by the bass. However, in low light intensities, the bass can locate the prey before they are seen. Walters et al. (1991) indicate that high light intensities may result in increased use of shade-producing structures.

The effect of over-water structures is the creation of a light/dark interface that allows ambush predators to remain in a darkened area (barely visible to prey) and watch for prey to swim by against a bright background (high visibility). Prey species moving around the structure are unable to see predators in the dark area under the structure and are more susceptible to predation.
The incorporation of grating into all of the docks and translucent panels into the two boathouses allows for more light penetration and diffuses the light/dark interface. This will minimize the susceptibility of

juvenile salmonids to piscivorous predation resulting from this project. The relocation of the boathouses to the new site will open up areas that were previously having a potential impact to salmonids. The addition of windows and translucent panels to the boathouses will decrease impacts to juvenile salmonids that are currently being experienced at the existing site.

In addition to piscivorous predation, in-water structures (tops of pilings) also provide perching platforms for avian predators such as double-crested cormorants (*Phalacrocorax auritis*), from which they can launch feeding forays or dry plumage. Their high energy demands associated with flying and swimming create a need for voracious predation on live prey (Ainley 1984). Cormorants are underwater pursuit swimmers (Harrison 1983) that typically feed on mid-water schooling fish (Ainley 1984), but they are known to be highly opportunistic feeders (Derby and Lovvorn 1997; Blackwell et al. 1997; Duffy 1995. Double-crested cormorants are known to fish cooperatively in shallow water areas, herding fish before them (Ainley 1984). Krohn et al. (1995) indicate that cormorants can reduce fish populations in forage areas, thus possibly affecting adult returns as a result of smolt consumption. Because their plumage becomes wet when diving, cormorants spend considerable time drying out feathers (Harrison 1983) on pilings and other structures near feeding grounds (Harrison 1984). The 35 piles proposed to support the dock structures will potentially provide for some usage by cormorants. Placement of anti-perching devices on the top of the pilings would preclude their use by any potential avian predators.

Riparian Alteration

Riparian habitats are one of the most ecologically productive and diverse terrestrial environments (Kondolf et al. 1996, Naiman et al. 1993). Vegetation in riparian areas influences channel processes through stabilizing bank lines, and providing large woody debris, terrestrial food sources rather than autochthonous food production, and regulating light and temperature regimes (Kondolf et al. 1996, Naiman et al. 1993).

The riparian area around Canoe Bay has been substantially altered by prior activities. The construction of the boatlift facility will not significantly change the bankline from what is currently at the site. The proposed revegetation of any riparian areas disturbed by construction activities will improve habitat conditions for salmonids within the action by changing plant species at the site to those that are more beneficial to aquatic species.

B. Critical Habitat

As described in previous sections of this BO, the Schooner Bay Boat Works Project may affect essential features of the critical habitat of Snake River sockeye salmon, Snake River spring/summer chinook salmon, and/or Snake River fall chinook salmon. The pier, dock, float and float house may provide habitat for predaceous fish, thereby inhibiting safe passage for juvenile salmonids. The proposed design configurations should minimize any impacts resulting from the project.

C. Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." For the purposes of this analysis, the action area encompasses the area around Canoe Bay. Future Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities are being (or have been) reviewed through separate section 7 consultation processes. The NMFS knows of no non-Federal actions that are reasonably certain to occur that may take listed salmonids within the action area.

VI. Conclusion

NMFS has determined that, based on the available information, the Schooner Creek Boat Works Project is not likely to jeopardize the continued existence of Snake River sockeye salmon, Snake River spring/summer chinook salmon, Snake River fall chinook salmon, Snake River steelhead, Upper Columbia River steelhead, Lower Columbia River steelhead, Middle Columbia River steelhead, Columbia River chum salmon, Lower Columbia River chinook salmon, and Upper Columbia River spring run chinook salmon and result in the destruction or adverse modification of critical habitat.

The NMFS reached this conclusion based on: 1) The fact that the use of translucent panels and grating on the docks and boathouses will not allow for increased effectiveness by predatory fish species, which would impair the biological requirement for increased migration survival by juvenile fish; 2) the modifications to the relocated boathouses would decrease existing impacts from predatory fish; 3) any disturbed vegetation in riparian areas would be replanted with species that are of higher benefit to aquatic species than those currently on site; 4) pilings would not provide habitat for avian predators; and 5) critical habitat will not be altered to the detriment of migrating juveniles.

VII. Conservation Recommendations

Section 7 (a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of a proposed action on listed species, to minimize or avoid adverse modification of critical habitat, or to develop additional information. NMFS believes the following conservation recommendation is consistent with these obligations, and therefore should be implemented by the COE:

1. To improve aquatic food production and insect drift into the river, the COE should recommend that the applicant plant as much of their bankline as possible, utilizing native plant species.

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects, or those that benefit listed species or their habitat, NMFS requests notification of the implementation of any conservation recommendations.

VIII. Reinitiation of Consultation

Consultation must be reinitiated if: The amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; new information reveals effects of the action may affect listed species in a way not previously considered; the action is modified in a way that causes an effect on listed species that was not previously considered; or, a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16).

IX. References

Ainley, D.G. 1984. Cormorants Family Phalacrocoracidae. Pages 92- 101 in D. Haley ed. Seabirds of the eastern North Pacific and Arctic waters. Pacific Search Press, Seattle. 214 pp.

Beamesderfer, R.C. and B.E. Rieman. 1991. Abundance and Distribution of Northern Squawfish, Walleyes, and Smallmouth Bass in John Day Reservoir, Columbia River. Transactions of the American Fisheries Society 120:439-447.

Bell, M.C. 1991. Fisheries handbook of Engineering requirements and biological criteria. Fish Passage Development and Evaluation Program. U.S. Army Corps of Engineers. North Pacific Division.

Bevelhimer, M.S. 1996. Relative importance of temperature, food, and physical structure to habitat choice by smallmouth bass in laboratory experiments. Trans. Am. Fish. Soc. 125:274-283.

Blackwell, B.F., W.B. Krohn, N.R. Dube and A.J. Godin. 1997. Spring prey use by double-crested cormorants on the Penobscot River, Maine, USA. Colonial Waterbirds 20(1):77-86.

Burgner, R.L. 1991. Life history of sockeye salmon (*Oncorhynchus nerka*). Pages 1-117 *In:* Groot, C. and L. Margolis (eds.). 1991. Pacific salmon life histories. Vancouver, British Columbia: University of British Columbia Press.

Busby, P., S. Grabowski, R. Iwamoto, C. Mahnken, G. Matthews, M. Schiewe, T. Wainwright, R. Waples, J. Williams, C. Wingert, and R. Reisenbichler. 1995. Review of the status of steelhead (*Oncorhynchus mykiss*) from Washington, Idaho, Oregon, and California under the U.S. Endangered Species Act. 102 p. plus 3 appendices.

Busby, P.J., T.C. Wainwright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-NWFSC-27, 261p.

Campbell, K.P. 1979. Predation principles in large rivers: A review. Pages 181-191 in R.H. Stroud and H. Clepper, editors. Predator-prey systems in fisheries management. Sport Fishing Institute, Washington D.C.

Colle, D.E., R.L. Cailteux, and J.V. Shireman. 1989. Distribution of Florida largemouth bass in a lake after elimination of all submersed aquatic vegetation. N. Am. Journal of Fish. Mgmt. 9:213-218.

Collis, K., R.E. Beaty and B.R. Crain. 1995. Changes in Catch Rate and Diet of Northern Squawfish Associated With the Release of Hatchery-Reared Juvenile Salmonids in a Columbia River Reservoir. North American Journal of Fisheries Management 15:346-357.

Dawley, E.M., R.D. Ledgerwood, T.H. Blahm, C.W. Sims, J.T. Durkin, R.A. Kirn, A.E. Rankis, G.E. Monan and F.J. Ossiander. 1986. Migrational Characteristics, Biological Observations, and Relative Survival of Juvenile Salmonids Entering the Columbia River Estuary. Final Report of Research. Bonneville Power Administration Contract DE-AI79-84BP39652. Project No. 81-102. 256 pp.

Derby, C.E. and J.R. Lovvorn. 1997. Predation on fish by cormorants and pelicans in a cold- water river: a field and modeling study. Can. J. Fish. Aquat. Soc. 54:1480-1493.

Duffy, D.C. 1995. Why is the double-crested cormorant a problem? Insights from cormorant ecology and human sociology. Pages 25-32 in The Double-crested Cormorant: biology, conservation and management (D.N. Nettleship and D.C. Duffy, eds.) Colonial Waterbirds 18 (Special Publication 1).

Dunsmoor, L.K., D.H. Bennett, and J.A. Chandler. 1991. Prey selectivity and growth of a planktivorous population of smallmouth bass in an Idaho reservoir. Pages 14-23 in D.C. Jackson (ed) The First International Smallmouth Bass Symposium. Southern Division American Fisheries Society. Bethesda, Maryland.

Fox, D.S., S. Bell, W. Nehlsen, and J. Damron. 1984. The Columbia River Estuary Atlas of Physical and Biological Characteristics. Columbia River Estuary Data Development Program. 87 pp.

Gerking, S.D. 1994. Feeding Ecology of Fish. Academic Press Inc., San Diego, CA. 416 pp.

Gray, G.A. and D.W. Rondorf. 1986. Predation on juvenile salmonids in Columbia Basin reservoirs. Pages 178-185 in G.E. hall and M.J. Van Den Avle eds. Reservoir Fisheries Management Strategies for the 80's. Southern Division American Fisheries Society, Bethesda, Maryland.

Harrison, C.S. 1984. Terns Family Laridae Pages 146-160 in D. Haley, D. ed. Seabirds of eastern North Pacific and Arctic waters. Pacific Search Press. Seattle. 214 pp.

Harrison, P. 1983. Seabirds: an Identification Guide. Houghton Mifflin Company. Boston. 448 pp.

Healey, M.C. 1991. Life history of chinook salmon (*Oncorhynchus tshawytscha*). Pages 311-393 *In:* Groot, C. and L. Margolis (eds.). 1991. Pacific salmon life histories. Vancouver, British Columbia: University of British Columbia Press.

Hobson, E. S. 1979. Interactions between piscivorous fishes and their prey. Pages 231-242 in R.H. Stroud and H. Clepper, editors. Predator-prey systems in fisheries management. Sport Fishing Institute, Washington D.C.

Howick, G. L. and W.J. O'Brien. 1983. Piscivorous feeding behavior of largemouth bass: an experimental analysis. Trans. Am. Fish. Soc. 112:508-516.

Johnson, O.W., W.S. Grant, R.G. Cope, K. Neely, F.W. Waknitz, and R.S. Waples. 1997. Status review of chum salmon from Washington, Oregon, and California. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-32, 280 p.

Kondolf, G.M., R. Kattlemann, M. Embury, and D.C. Erman. 1996. Status of riparian habitat. Pages 1009-1029 in Sierra Nevada Ecosystem Project: Final report to Congress, vol. II, assessments and scientific basis for management options. University of California, Davis, Centers for Water and Wildland Resources.

Krohn, W.B., R.B. Allen, J.R. Moring and A.E. Hutchinson. 1995. Double-crested cormorants in New England; population and management histories. Pages 99-109 in The Double-crested Cormorant: biology, conservation and management (D.N. Nettleship and D.C. Duffy, eds.) Colonial Waterbirds 18 (Special Publication 1).

Larkin, P.A. 1979. Predator-prey relations in fishes: an overview of the theory. Pages 13-22 in R.H. Stroud and H. Clepper, editors. Predator-prey systems in fisheries management. Sport Fishing Institute, Washington D.C.

Matthews, G.M. and R.S. Waples. 1991. Status review for Snake River spring and summer chinook salmon. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-F/NWC-200, 75 p.

Mesing, C.L. and A.M. Wicker. 1986. Home range, spawning migrations, and homing of radio-tagged Florida largemouth bass in two central Florida lakes. Trans. Am. Fish. Soc. 115:286-295.

Myers, J.M., R.G. Kope, G.J. Bryant, D. Teel, L.J. Lierheimer, T.C. Wainwright, W.S. Grant, F.W. Waknitz, K. Neely, S.T. Lindley, and R.S. Waples. 1998. Status review of chinook salmon from Washington, Idaho, Oregon, and California. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-35, 443 p.

Naiman, R.J., H. DeCamps, and M. Pollock. 1993. The role of riparian corridors in maintaining regional biodiversity. Ecological Applications, 3(2):209-212.

ODFW and WDFW. 1998. Status Report Columbia River Fish Runs and Fisheries, 1938-1997. 299 pp.

Parente, W.D. and J.G. Smith. 1981. Columbia River Backwater Study Phase II. U.S. Dept of Interior. Fisheries Assistance Office. Vancouver, Washington. 87 pp.

Petersen, C.J., D.B. Jepsen, R.D. Nelle, R.S. Shively, R.A. Tabor, T.P. Poe. 1990. System-Wide Significance of Predation on Juvenile Salmonids in Columbia and Snake River Reservoirs. Annual Report of Research. Bonneville Power Administration Contract DE-AI79-90BP07096. Project No. 90-078. 53 pp.

Petersen, J.M. and D.M. Gadomski. 1994. Light-Mediated Predation by Northern Squawfish on Juvenile Chinook Salmon. Journal of Fish Biology 45 (supplement A), 227-242.

Pflug, D.E. and G.B. Pauley. 1984. Biology of Smallmouth Bass (*Micropterus dolomieui*) in Lake Sammamish, Washington. Northwest Science 58(2):119-130.

Poe, T.P, H.C. Hansel, S. Vigg, D.E. Palmer, and L.A. Prendergast. 1991. Feeding of Predaceous Fishes on Out-Migrating Juvenile Salmonids in John Day Reservoir, Columbia River. Transactions of the American Fisheries Society 120:405-420.

Raibley, P.T., K.S. Irons, T.M. O'Hara, and K.D. Blodgett. 1997. Winter habitats used by largemouth bass in the Illinois River, a large river-floodplain ecosystem. N. Am. J. Fish. Mgmt. 17:401-412.

Rieman, B.E. and R.C. Beamesderfer. 1991. Estimated Loss of Juvenile Salmonids to Predation by Northern Squawfish, Walleyes, and Smallmouth Bass in John Day Reservoir, Columbia River. Transactions of the American Fisheries Society 120:448-458.

Salo, E.O. 1991. Life history of chum salmon (*Oncorhynchus keta*). Pages 231-309 *In:* Groot, C. and L. Margolis (eds.). 1991. Pacific salmon life histories. Vancouver, British Columbia: University of British Columbia Press.

Walters, D.A., W.E. Lynch, Jr., and D.L. Johnson. 1991. How depth and interstice size of artificial structures influence fish attraction. N. Am. J. Fish. Mgmt. 11:319-329.

Wanjala, B.S., J.C. Tash, W.J. Matter and C.D. Ziebell. 1986. Food and habitat use by different sizes of largemouth bass (*Micropterus salmoides*) in Alamo Lake, Arizona. Journal of Freshwater Ecology Vol. 3(3):359-368.

Waples, R.S., O.W. Johnson, and R.P. Jones, Jr. 1991a. Status review for Snake River sockeye salmon. U.S. Dept. Commer., NOAA Tech. Memo. NMFS F/NWC-195. 23 p.

Waples, R.S., R.P. Jones, Jr., B.R. Beckman, and G.A. Swan. 1991b. Status review for Snake River fall chinook salmon. U.S. Dept. Commer., NOAA Tech. Memo. NMFS F/NWC-201. 73 p.

Ward, D.L. (ed). 1992. Effects of waterway development on anadromous and resident fish in Portland Harbor. Final Report of Research. Oregon Dept. of Fish and Wildlife. 48 pp.

Ward, D.L. and A.A. Nigro. 1992. Differences in Fish Assemblages Among Habitats Found in the Lower Willamette River, Oregon: Application of and Problems With Multivariate Analysis. Fisheries Research 13:119-132.

Ward, D.L., A.A. Nigro, R.A. Farr, and C.J. Knutsen. 1994. Influence of Waterway Development on Migrational Characteristics of Juvenile Salmonids in the Lower Willamette River, Oregon. North American Journal of Fisheries Management 14:362-371.

Ward, D.L., C.J. Knutsen, and R.A. Farr. 1991. Status and biology of black crappie and white crappie in the lower Willamette River near Portland, Oregon. Oregon Department of Fish and Wildlife Fish Division Information Reports Number 91-3. Portland, Oregon. 17 pp.

X. Incidental Take Statement

Sections 4 (d) and 9 of the ESA prohibit any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, and sheltering. Harass is defined as actions that create the likelihood of injuring listed species to such an extent as to significantly alter normal behavior patterns which include, but are not limited to, breeding, feeding, and sheltering. Incidental take is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary; they must be implemented by the action agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The COE has a continuing duty to regulate the activity covered in this incidental take statement. If the COE: 1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document; and/or (2) fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

A. Amount or Extent of the Take

The NMFS anticipates that the action covered by this BO has more than a negligible likelihood of resulting in incidental take of listed and proposed species because of impairment of juvenile migration survival, alteration of critical habitat, and the cumulative effect of continued placement of in-water structures and urban growth in the lower Columbia River. The subject action, however, as described in the BO, is expected to result in a low level of incidental take of listed and proposed species in the proposed action area. Effects of the action such as these are largely unquantifiable, but are not expected to be measurable as long-term effects on the species' habitat or population levels. Therefore, even though the NMFS expects an incidental take to occur due to the action covered by this BO, the best scientific and commercial data available are not sufficient to enable NMFS to estimate a specific amount of incidental take to the listed and proposed species themselves. In instances such as these, the NMFS designates the expected level of take as "unquantifiable." Based on the information in the BA,

the NMFS anticipates that an unquantifiable amount of incidental take could occur as a result of the action covered by this BO.

B. Reasonable and Prudent Measures

The NMFS believes that the following reasonable and prudent measures are necessary and appropriate to minimizing take of the listed and proposed species and/or minimize the adverse modification of designated or proposed critical habitat.

1. To minimize predation of salmon by predatory fish, all measures designed to transmit light (gratings, translucent panels, windows) shall be maintained in functional condition.

2. To minimize predation of salmon by avian predators, measures shall be taken to prevent birds from perching on the tops of all pilings.

3. To assure that minimization measures are being met, the COE shall monitor permit conditions and report the results to NMFS.

C. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the COE must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1a. To minimize the amount of shaded area from docks that may be utilized by predaceous fish, the COE shall require, as part of the permit, that the grating on the floating dock shall be kept clear of all items, so that light passage is maintained at all times.

1b. To minimize the amount of shaded area from the two boathouses that may be utilized by predaceous fish, the COE shall require, as part of the permit, that translucent panels will be maintained in the roofs and sides of the structures.

2. To minimize the use of pilings by avian predators, the COE shall require that all exposed pilings be fitted with bird anti-perching devices.

3a. The COE shall inspect the site at the completion of construction to ascertain if the required construction standards have been met.

3b. The COE shall also ascertain the status of any planted vegetation during this inspection and conduct a final inspection during the fifth year after any plantings.

3c. The COE shall report the results of the site visit to NMFS, if any of the permit conditions are not being meet and what measures were taken to rectify the problem.